



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

EX PARTE TAKAHIRO SAITO et al.

Application for Patent

Filed March 12, 2004

Serial No. 10/800,386

FOR:

INFORMATIN CODE AND ITS READING DEVICE

AMENDED APPEAL BRIEF

CERTIFICATE OF MAILING

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Signature: _____

Jiawei Huang, Reg. No. 43,330

JC PATENTS

Representative for Applicant

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I. Real party in interest

The real party in interest is Takahiro Saito, the sole inventor named in the subject application.

II. Related appeals and interferences

There are no related appeals and/or interferences.

III. Status of the claims

Claims 1-5 were canceled when filing the present divisional application. A total of nine (9) claims 6-14 were presented during prosecution of this application. Claims 6-14 were rejected. Applicant appeals rejected claims 6-14.

IV. Status of amendments

Applicant filed a response after final rejection, without amending the claims and the specification, presenting a Declaration of the sole inventor and evidences to antedate the cited Ackley reference (US 6,375,075).

In an Advisory Action, the Examiner indicated that the Declaration and the evidences would not be entered, and stated that the request for reconsideration has been considered, but does not place the application in condition for allowance because:

(a) "The affidavit provided has sufficient evidence to show conception as of the applicant's foreign filing date of November 28, 1997. However, in order to be acceptable to disqualify Ackley as a 102(e) reference, diligence must be shown from the date of conception to the filing date of the Ackley reference"; and

(b) "Furthermore, examiner respectfully submits that the Exhibit A (disclosure that was filed 28 November 1997 and published 18 June 1999) as provided by the applicant would now qualify as evidence of loss of right to a patent under 35 U.S.C. 102(d) and such a rejection will be made on appeal".

V. Summary of claimed subject matter

One aspect of the present invention relates to an information code comprising a plurality of bars in a predetermined pattern of arrangement according to a conventional black and white bar code structure. The bars include at least three types of bars in such a manner that each of the three types of the bars has a reflected wavelength characteristic different from that of other bars among the three types of the bars so that the reflected wavelength characteristic of the bars when combined forms a unit of displaying information. Page 4, line 3 to page 5, line 3.

Another aspect of the present invention relates to an information code comprising a plurality of bars in a predetermined pattern of arrangement defined by JAN code. The bars include conventional black and white bars and at least three types of bars in such a manner that each of the three types of the bars has a reflected wavelength characteristic different from that of other bars among the three types of the bars so that the reflected wavelength characteristic of the bars when combined forms a unit of displaying information. Page 10, line 20 to page 11, line 10, and Fig. 1.

VI. Grounds of rejection to be reviewed on appeal

A. Claims 6-8 were rejected under 35 U.S.C. 102(e) as being anticipated by Ackley et al. (US 6,375,075, hereafter "Ackley").

B. Claims 9-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Yoshinaga (US 6,073,842, hereafter "Yoshinaga").

C. Claims 6-14 would be rejected under 35 U.S.C. 102(d) as anticipated by Japanese Unexamined Patent Publication No. 11-161757 (Japanese patent application No. 9-328040).

VII. Arguments

1. The related law

35 U.S.C. 104 Invention made abroad.

(a) IN GENERAL.—

(1) PROCEEDINGS.—In proceedings in the Patent and Trademark Office, in the courts, and before any other competent authority, an applicant for a patent, or a patentee, may not establish a date of invention by reference to knowledge or use thereof, or other activity with respect thereto, in a foreign country other than a NAFTA country or a WTO member country, except as provided in sections 119 and 365 of this title.

(2) RIGHTS.—If an invention was made by a person, civil or military—

(A) while domiciled in the United States, and serving in any other country in connection with operations by or on behalf of the United States,

(B) while domiciled in a NAFTA country and serving in another country in connection with operations by or on behalf of that NAFTA country, or

(C) while domiciled in a WTO member country and serving in another country in connection with operations by or on behalf of that WTO member country, that person shall be entitled to the same rights of priority in the United States with respect to such invention as if such invention had been made in the United States, that NAFTA country, or that WTO member country, as the case may be.

(3) USE OF INFORMATION.—To the extent that any information in a NAFTA country or a WTO member country concerning knowledge, use, or other activity relevant to proving or disproving a date of invention has not been made available for use in a proceeding in the Patent and Trademark Office, a court, or any other competent authority to the same extent as such information could be made available in the United States, the Director, court, or such other authority shall draw appropriate inferences, or take other action permitted by statute, rule, or regulation, in favor of the party that requested the information in the proceeding.

(b) DEFINITIONS.—As used in this section—

(1) The term “NAFTA country” has the meaning given that term in section 2(4) of the North American Free Trade Agreement Implementation Act; and

(2) The term “WTO member country” has the meaning given that term in section 2(10) of the Uruguay Round Agreements Act.

37 CFR § 1.131 Affidavit or declaration of prior invention.

(a) When any claim of an application or a patent under reexamination is rejected, the inventor of the subject matter of the rejected claim, the owner of the patent under reexamination, or the party qualified under §§ 1.42, 1.43, or 1.47, may submit an appropriate oath or declaration to establish invention of the subject matter of the rejected claim prior to the effective date of the reference or activity on which the rejection is based. The effective date of a U.S. patent, U.S. patent application publication, or international application publication under PCT Article 21(2) is the earlier of its publication date or date that it is effective as a reference under 35 U.S.C. 102(e). Prior invention may not be established under this section in any country other than the United States, a NAFTA country, or a WTO member country. Prior invention may not be established under this section before December 8, 1993, in a NAFTA country other than the United States, or before January 1, 1996, in a WTO member country other than a NAFTA country. Prior invention may not be established under this section if either:

(1) The rejection is based upon a U.S. patent or U.S. patent application publication of a pending or patented application to another or others which claims the same patentable invention as defined in § 41.203(a) of this title, in which case an applicant may suggest an interference pursuant to § 41.202(a) of this title; or

(2) The rejection is based upon a statutory bar.

(b) The showing of facts shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective date of the reference coupled with due diligence from prior to said date to a subsequent reduction to practice or to the filing of the application. Original

exhibits of drawings or records, or photocopies thereof, must accompany and form part of the affidavit or declaration or their absence must be satisfactorily explained.

2. Remarks

- A. Claims 6-8 were rejected under 35 U.S.C. 102(e) as being anticipated by Ackley et al. (US 6,375, 075, hereafter "Ackley").

Appellant traverses the rejection because the invention date of the claimed invention as established below antedates the 102(e) date of Ackley.

US 6,375,075 to Ackley was filed on October 18, 1999 (the 102(e) date) in this country and issued on April 23, 2002. As stated in the attached Declaration (labeled as Exhibit C) of the sole inventor, Takahiro Saito, the claimed invention of the present application was described in Japanese patent application No. 9-328040, which was filed on November 28, 1997 by the sole inventor, Takahiro Saito, and published on June 18, 1999 as Japanese Unexamined Patent Publication No. 11-161757. The attached Exhibit A is a true copy of Japanese Unexamined Patent Publication No. 11-161757. Also enclosed herewith is a true English translation of Exhibit A (labeled as Exhibit B). The disclosure of patent application No. 9-328040 fully supports all pending claims 6-14 of the present application. The above evidences show that Takahiro Saito constructively reduced the claimed invention of the present application to practice by filing in Japan on November 28, 1997 before the 102(e) date of Ackley. Therefore, the invention date of the present application antedates Ackley, and Ackley should not be used as prior art against the present application.

The present application is a division of US patent application No. 10/424,650 filed on April 25, 2003, which claims the priority benefit of US patent application No. 09/729,414 filed on December 4, 2000, which in turn claims the priority benefit of US provisional patent application No. 60/170,815 filed on December 15, 1999. A review of our files shows that the pending claims 6-14 of the present application are fully supported by the provisional application No. 60/170,815. Japanese application No. 9-328040 was published on June 18, 1999 within one year from the filing date of US provisional application No. 60/170,815 and, thus, does not constitute a statutory bar to the present application under 35 U.S.C. 102(b).

- B. Claims 9-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Ackley in view of Yoshinaga (US 6,073,842, hereafter "Yoshinaga").

For the same reasons discussed above, the Ackley reference should be removed. Withdrawal of the rejection is requested.

- C. Claims 6-14 would be rejected under 35 U.S.C. 102(d) as anticipated by Japanese Unexamined Patent Publication No. 11-161757 (Japanese patent application No. 9-328040).

In the Advisory Action of September 30, 2005, the Examiner indicated that Japanese patent application No. 9-328040 would qualify as evidence of loss of right to a patent under 35 U.S.C. 102(d) and such a rejection will be made on appeal.

Applicant respectfully disagrees.

35 U.S.C. 102(d) states;

"(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or"

Japanese patent application No. 9-328040 was not issued into a patent before the filing date of the provisional application No. 60/170,815, of which the present application claims the priority benefit and, thus does not constitute a statutory bar under 35 U.S.C. 102(d).

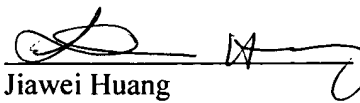
Conclusion

In view of the above discussion and the submitted evidences, Applicant believes that Ackley does not qualify as prior art of the present invention and the rejections under 35 U.S.C. §102 and §103 are in error, and respectfully requests the Board of Patent Appeals and Interferences to reverse the Examiner's rejections of the claims on appeal.

Date: 10/6/2006

4 Venture, Suite 250
Irvine, CA 92618
Tel.: (949) 660-0761

Respectfully submitted,
J.C. PATENTS


Jiawei Huang

Registration No. 43,330

VIII. Claims appendix

Claims 1-5. (canceled)

6. (previously presented) An information code comprising a plurality of bars shown on a product, following a predetermined pattern of arrangement according to a conventional black and white bar code structure, said bars including at least three types of bars in such a manner that each of said three types of the bars has a reflected wavelength characteristic different from that of other bars among said three types of the bars so that said reflected wavelength characteristic of said bars when combined forms a unit of displaying information.

7. (previously presented) An information code according to claim 6, wherein said three types of bars include a red bar, a green bar, and a blue bar.

8. (previously presented) An information code according to claim 6, wherein said three types of bars include a white color bar and a black color bar and another bar with color selected from a color group consisting of red, blue, and green.

9. (previously presented) An information code according to claim 6, wherein said conventional black and white bar code structure includes a JAN code consisting of 13 modules, and each of the modules consists of 7 bars.

10. (previously presented) An information code according to claim 6, wherein said conventional black and white bar code structure includes a standard ITF code.

11. (previously presented) An information code according to claim 6, wherein said conventional black and white bar code structure includes a NW-7 code.

12. (previously presented) An information code according to claim 6, wherein said plurality of bars includes 13 modules, each of which consists of 7 bars and the color of said plurality of bars include black, white, a first color other than black and white, a second color other than black, white, and the first color, and a third color other than black, white, the first color, and the second color so that total $5^{(7 \times 13)}$ different information items can be expressed.

13. (previously presented) An information code comprising a plurality of bars printed on a product, following a predetermined pattern of arrangement defined by JAN code, said bars including conventional black and white bars and 3 types of bars in such a manner that each of said three types of the bars has a reflected wavelength characteristic different from that of other bars among said three types of the bars so that said reflected wavelength characteristic of said bars when combined with wavelength characteristics of said black and white bars forms a unit of displaying information.

14. (previously presented) An information code comprising:
 thirteen modules,
 each of said modules consisting of 7 bars, according to a predetermined pattern of arrangement,
 wherein said thirteen modules including a black bar and a white bar and at least three types of other bars in such a manner that each of said three types of the bars has a reflected wavelength characteristic different from that of other bars among said three types of the bars so that said reflected wavelength characteristic of said bars when combined forms a unit of displaying information,
 wherein said thirteen modules is formed to represent 13-digit numerals, in which,
 the first two digit numerals represent a national number,
 the next five digit numerals a manufacturer number,
 the following five digit numerals a commodity number, and
 the final-digit numeral is for use in checking,
 wherein said three types of bars include color bars having different colors other than black and white.

IX. Evidence appendix

Exhibit A:

Japanese Unexamined Patent Publication No. 11-161757

Exhibit B:

English translation of Japanese Unexamined Patent Publication No. 11-161757 with a
CERTIFICATION of the translator, Shintaro Tateyama

Exhibit C:

Declaration of the sole inventor, Takahiro Saito

X. Related proceedings appendix

There are no decisions rendered by a court or the Board in the proceeding identified in
the Related Appeals and Interferences section of the brief.

(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開平11-161757

(43)公開日 平成11年(1999) 6月18日

(51)Int.Cl. ⁶	識別記号	F I	
G 0 6 K	19/06	G 0 6 K	19/00 A
	7/00		7/00 E
	7/12		7/12 A
G 0 9 F	3/00	G 0 9 F	3/00 M
		G 0 6 K	19/00 E
審査請求 未請求 請求項の数 4 O L (全 7 頁)			

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(71)出願人 597166914

斎藤 孝弘

八尾市南本町6丁目2番24号 八尾コーポ

ラス143号

(72)発明者 斎藤 孝弘

八尾市南本町6丁目2番24号 八尾コーポ

ラス143号

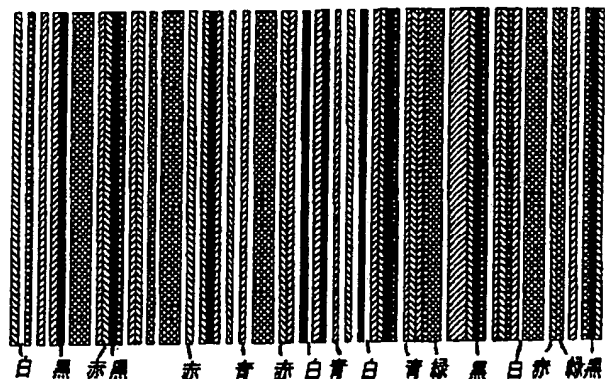
(74)代理人 弁理士 江原 省吾 (外3名)

(54)【発明の名称】 情報コード及びその読み取り装置

(57)【要約】

【課題】 バーコード等のモノクロの情報コードの表示量が限られているため各表示項目で表示できる数、及び表示項目数が不足している現状を、識別コードを大きくしないで解決する。

【解決手段】 情報コードを、色（反射又は放射の波長特性）が異なる3種以上の表示領域を所定の配列で並べて形成し、この配列における表示領域の波長特性の組み合わせを情報表示の要素とする。



情報コード

【特許請求の範囲】

【請求項1】 反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成され、この配列における表示領域の波長特性の組み合わせを情報表示の要素としたことを特徴とする情報コード。

【請求項2】 モノクロで表わされた他の情報コードの一つと同一の配列で表示領域を並べた表示パターンを有し、各表示領域に、反射又は放射の波長特性が異なる3種以上の表示領域を用い、この配列における表示領域の波長特性の組み合わせを情報表示の要素とするものであって、

上記配列における表示領域の波長特性の組み合わせと表示情報の関係の取決めに、前記他の情報コードで規定されたモノクロの情報表示の取決めを含ませたことを特徴とする情報コード。

【請求項3】 反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成した情報コードから得られる反射光又は放射光を異なる波長毎に分離するフィルタと、

フィルタで分離した各波長の光を光電変換する複数の検出器と、

各検出器の出力が所定の判定レベルを超えているか否かを判定する複数の判定回路と、

各判定回路の出力の組合わせから情報コードに表示された情報を解読して出力するデコーダを備えたことを特徴とする情報コードの読み取り装置。

【請求項4】 反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成した情報コードに対応させ、その表示領域の異なる波長特性に対応して用意された複数の単色光源と、

各単色光源を時分割発光させる駆動回路と、

情報コードの反射光又は放射光を光電変換する検出器と、

検出器の出力を上記駆動回路の駆動信号に同期させて各波長成分毎に取り出し、各波長成分毎の出力が所定の判定レベルを超えているか否かにより各波長成分の有無を判定する判定回路と、

判定回路の各色毎の出力の組合わせから、情報コードに表示された情報を解読して出力するデコーダを備えたことを特徴とする情報コードの読み取り装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、色等の波長特性の組み合わせによって情報を表示する情報コード及びその読み取り装置に関する。

【0002】

【従来の技術】 バーコード等の情報コードは、簡単に印刷でき読み取り容易な商品等の情報表示手段として、広く用いられている。

【0003】 バーコードには、JAN、標準ITF、C 50

ODE=138、CODE=39、NW-7コード等があり、夫々固有の表示形式を持つ。広く使用されているJANコードの表示形式は、黒又は白の7本のバーを組み合わせで1つの数字を表わす1モジュールを形成し、このモジュールを13個並べることにより、13桁の数字を表している。この13桁の数字は、最初の2桁は国番号、次の5桁でメーカー、続く5桁で商品を表わし、最後の1桁を検算用に使用している。

【0004】

【発明が解決しようとする課題】 上記JANコードは数字を13桁しか表現できず、多品種小量化の進んだ現在、商品に割り当てられた5桁では、商品の登録可能数が不足し、新たに商品を登録するために、既に扱わなくなった商品の登録を抹消しなければならない事態が生じている。

【0005】 このような情報表示量の不足は、バーコードを採用する分野が広がるに伴って、顕著になって来ている。例えば電話の通話明細書では、バーの本数を増加したロングバーコードと標準型のバーコードを並べて印刷することにより、情報表示量の不足をカバーしようとしている。しかし、このように複数のバーコードを並べて表記する方法は、文字等を印刷する表示面を大きく圧迫して美観を損なう、ハンディスキャナで読み取ろうとすると長くなったバーコードを読み落とし易い、大きな表示スペースが確保できる場合にしか採用できないといった問題があり、根本的な解決策にはなっていない。

【0006】 また、バーコードの新たな利用方法として、製造年月日、製造者名、バック年月日、賞味期限等を同時に表示し、商品の購入者が支払いを行うとき、この情報を読み取り記録し、販売管理、商品管理等に利用することが考えられているが、モノクロ（黒と白、赤と白のように、地色に対して一色の色を使用することを意味する。）のバーコードで、このような多くの情報を表示しようとする、表示パターンが複雑化すると共にバーコードラベルが大型化し、実用的でなくなるという問題があった。

【0007】 さらに、工業製品の生産管理現場においては、管理対象とする部品や製品等に、単なる情報票を付けるだけでなく、その製造履歴や検査結果等の詳細な情報を情報コードによって表示し、製造現場又は出荷現場において、大型コンピュータ等を用いた管理システムに問い合わせることなく、部品や製品の詳細な情報を得るようにすることも考えられている。

【0008】 しかし、この場合においても、モノクロの情報コードの情報表示量の限界のため実用的なシステムを作ることは困難であった。

【0009】 そこで、本発明は、表示パターンを変えなくても表示できる情報量を大幅に増大して、上記問題を解決できる情報コードを提供することを目的とする。

【0010】

【課題を解決するための手段】(1) 本発明の情報コードは、反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成され、この配列における表示領域の波長特性の組み合わせを情報表示の要素としたことを特徴とする。

【0011】ここで、反射又は放射の波長特性が異なるとは、所定の配列で並べられて情報コードを形成する表示領域の色が異なること、及び情報コードをステルスコードとして形成した場合に、その表示領域に印刷された蛍光体の放射波長が異なることをいう。また反射又は放射の波長特性が異なる3種以上の表示領域とは、上記波長特性の異なる表示領域が3種類以上あることを意味し、表示領域の大きさ又は形状の異なるものを使用する場合は、表示領域の種類数は、これらを組み合わせた数となる。

【0012】この情報コードで表示できる情報量は、表示領域の種類数を、並べられた表示領域数でべき乗した値となるので、モノクロで表示された情報コードに比べて、非常に多くの情報を表すことが出来るようになる。

【0013】(2) 本発明の情報コードを、モノクロの既存の情報コードと切換えて、採用しようとする場合に、その既存の情報コードにかかわる企業が非常に多いと、本発明の情報コードへの移行をスムーズに行なえない。

【0014】そこで、他のモノクロの情報コードと共用できる情報コードとして次のものを提供する。

【0015】この情報コードは、モノクロで表わされた他の情報コードの一つと同一の配列で表示領域を並べた表示パターンを有し、各表示領域に、反射又は放射の波長特性が異なる3種以上の表示領域を用い、この配列における表示領域の波長特性の組み合わせを情報表示の要素とするものであって、上記配列における表示領域の波長特性の組み合わせと表示情報の関係の取決めに、前記他の情報コードで規定されているモノクロの情報表示の取決めを含ませたものである。

【0016】この情報コードにおいて、モノクロの情報表示の取決めに割り当てられる情報の数は、全体の表示可能数に比べてかなり少ないので、本発明の表示する情報量を多くできるという特長を損なわないで、上記他の情報コードから本発明の情報コードへの移行をスムーズに行うことができる。

【0017】(3) 上記情報コードはモノクロの情報コードと異なり、各表示領域に反射又は放射の波長特性が3種以上に異なるものを用いているので、これを区別して読み取る必要がある。

【0018】この読み取り装置は、(a) 光源として白色光を用いた場合と、(b) レーザ光源等の単色光を用いた場合が2種類がある。

【0019】(a) 光源として白色光を用いた場合の

読み取り装置は、反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成した情報コードから得られる反射光又は放射光を、検出波長毎に分離するフィルタと、フィルタで分離した各波長の光を光電変換する複数の検出器と、各検出器の出力が所定の判定レベルを超えているか否かを判定する複数の判定回路と、各判定回路の出力の組合わせから情報コードに表示された情報を解読して出力するデコーダを備える。

【0020】(b) また、レーザ光源等の単色光源を用いた場合の読み取り装置は、反射又は放射の波長特性が異なる3種以上の表示領域を所定の配列で並べて形成した情報コードに対応させ、その表示領域の異なる波長特性に対応して用意された複数の単色光源と、各単色光源を時分割発光させる駆動回路と、情報コードからの反射光又は放射光を光電変換する検出器と、検出器の出力を上記駆動回路の駆動信号に同期させて各波長成分毎に取り出し、各波長成分毎の出力が所定の判定レベルを超えているか否かにより各波長成分の有無を判定する判定回路と、判定回路の各色毎の出力の組合わせから、情報コードに表示された情報を解読して出力するデコーダを備える。

【0021】

【発明の実施の形態】図1に示す情報コード1は、JANコードと同一の表示パターンを用いた本発明の一実施形態である。この情報コードにおいて、各バーを表わす色は、白と黒の他に、光の三原色である赤、緑、青を用いている。したがって、1本のバー（図面上幅の広いバーは同色のバーが連なった複数本のバーである。）で5種類の情報を表わすことができる。情報コードは、この色の組合わせによって情報を表すので、この情報コードは、 $5^{(7 \times 13)} = 4.03897 \times 10^{63}$ 個の情報を表現できる。これは従来のモノクロのJANコードで表現できる情報量の $2^{(7 \times 13)} = 2.47588 \times 10^{27}$ 個と比較すると、 1.63133×10^{36} 倍もの情報量である。

【0022】したがって、従来に比べて、表現できる情報量が飛躍的に多くなり、情報コードの表示項目数を増大させ、各項目の表示桁数を多く取ることが可能になる。

【0023】これを、スーパーマーケットの商品に付ける情報コードを例に挙げて説明すると、本発明の情報コードを利用すれば、製造年月日、パック年月日、生産者等の項目を新たに追加して管理効率を向上し、商品の登録数を増加して、新規商品の登録のために取り扱わなくなった商品の登録を抹消する手間をなくすことができる。

【0024】本発明の情報コードの読み取り装置の構成例を説明する。図2は白色光源を用いた読み取り装置の例を示すもので、2は白色光源、3は白色光源から出た光を情報コード1に集光する投光光学系、4は情報コー

ド1から出た光を結像させる受光光学系である。5は情報コード1から出た光を各波長成分毎に分離するフィルタで、図示例では赤色光を反射し他の波長の光を透過させるダイクロイックミラー5R、緑色光を反射し、他の波長の光を透過させるダイクロイックミラー5G、残りの青色光を反射させる通常の反射鏡5Bを用いている。6R、6G、6Bは赤、緑、青の各色に対応して設けられた検出器で、例えばスキャン式の読み取りを行う場合は、フォトダイオード等、タッチ式の読み取りを行う場合はCCDセンサ等が使用される。7R、7G、7Bは各色の検出器に対応して設けられた増幅器、8R、8G、8Bは各色毎に設けられた判定回路で、増幅器7R、7G、7Bの出力を所定の基準レベルと比較して、各色（赤、緑、青）の有無の判定出力をする。9はデコーダで、所定のタイミング信号を用いて各バーの色を判定し、予め規定されたバーの色の並びと情報の関係に従って、表示された情報を解読して出力する。

【0025】なお、上記タイミング信号は、例えばクロック信号で計測したバーの幅の計測時間を基準にして作られる。

【0026】また、判定回路8R、8G、8Bの出力はRGBの3種であるのに対し、バーの色には白色と黒色が含まれるので、デコーダ9は、図3に示すようにRGBの3色が全て有るとき白色、RGBの3色が全て無るとき黒色と判定している。赤、緑、青の判定は、白の判定がされないという条件で、R、G、Bの信号を用いる。

【0027】上記デコーダ9が解読して出力する情報コードの表示情報に基づいて、所定の演算処理が行われ、ディスプレイあるいは紙への出力、また管理用コンピュータへの記録等が行われる。

【0028】図4はレーザスキャナやホログラムスキャナのように、情報コードをレーザ光源等の単色光源を用いて読み取る場合の実施例を示す。この実施例は、情報コードで使用している色に対応させて、単色光源であるレーザ光源を複数用い、これを時分割発光させている。

【0029】図4において、11R、11G、11Bは、夫々、赤、緑、青の各色で発光するレーザ光源等の単色光源、12は各レーザ光源を時分割発光させる駆動回路、13R、13G、13Bはレーザ光源の発した光を情報コード1に導く投光側光学系、14は情報コード1で反射した光を受ける受光側光学系、15は受光側光学系14を通過した光を光電変換するフォトダイオード等の検出器、16は光電変換出力を増幅する増幅器である。17は判定回路で、増幅器16の出力を上記駆動回路12の駆動信号に同期させて各波長成分毎に取り出し、各波長成分毎の出力が所定の判定レベルを超えているか否かにより各波長成分の有無を判定する。18はデコーダで、判定回路の判定結果の組合わせから、情報コ

ードに表示された情報を解読してデジタル信号で出力する。このデコーダにおける、タイミング信号を基準にした各バーの区別、白色と黒色の識別、及びデコーダの出力処理は、図2に示した実施例と同様に行われる。

【0030】上記時分割方式は、レーザ光源を使用する他に、例えばRGBの三色の発光ダイオードを用いることによっても採用可能である。時分割方式は、フォトダイオードやCCDセンサ等の受光器及びその出力の処理回路を共用でき、白色光源を用いた場合のようにフィルタ及び受光器を複数設ける必要がないので、受光側の構造を簡単にできる利点がある。

【0031】次に、モノクロの情報コードを使用している現場に、本発明の情報コードを採用する場合について説明する。

【0032】情報コードの情報量の不足を解消するため、本発明の情報コードを採用しようとする場合、例えば情報コードを付けている商品等の製造メーカーが非常に多いと、これに一時に対応することはできない。

【0033】この場合において、商品等に、それまで使用していたモノクロの情報コードと新たに採用した情報コードのどちらが付けられていても読み取り可能とするために、読み取り手段を重ねて設けると、読み取り装置が複雑になって、コストが高くなる。

【0034】そこで、本発明の情報コードの表示パターンを、他のモノクロのバーコードと同一のパターンにするとともに、本発明の情報コードにおける表示領域の組み合わせと表示情報の関係の取決めに、前記他の情報コードで規定されたモノクロの情報表示の取決めを含ませることにより、読み取り装置のコストを高くすることなく、その移行を容易に行なえるようにする。

【0035】これは、例えば、図1に示すように、JANコードと同一のパターンにより白、黒、赤、緑、青の5色で、本発明の情報コードを構成し、この色の組合わせによって形成される表示パターンの内、白と黒のみによって形成されるものを、そのままJANコードのバーコードとして利用するものである。従来のモノクロのJANコードと本発明の複色で表現する情報コードとは、例えば1桁の数字を表わすのに使用するバーの本数が異なるといったように、表示の仕方が異なるので、これを区別して読み取る必要がある。

【0036】この処理手順は、例えば図5に示すようになる。これは、例えば、図4に示す装置の判定回路17及びデコーダ18の処理手順の一部を示すもので、まず、増幅器16から出力された受光信号を、駆動回路12の時分割信号とタイミング信号により各バーについて、RGBの三色の有無を判断する。次に、図3で説明した原理に基づいて、各バーの白、黒、赤、緑、青の判定を行う。さらに、全てのバー又は特定範囲のバーの色が、全て白又は黒であるか否かにより、従来のJANコードが使用されているか否かを判断する。従来のJANコ

ードで表現されている場合は、JANコードの解釈テーブルを参照し、また、本発明の情報コードで表現されている場合は、本発明の情報コードの解釈テーブルを参照して、表示されているデータを解読しデジタルデータで出力する。なお、上記JANコードが使用されているか否かの判定は、情報コード全体で行う他に、情報コード中の、例えば商品コードといった情報単位毎に行なっても良い。

【0037】以上の説明は、JANコードと同一の表示パターンを持つものについて行なったが、本発明の情報コードは、標準ITF、CODE=138、CODE=39、NW-7コード等の他の表示形態を持つバーコードにおいても同様に実施できる。例えば標準ITF、CODE=138は、幅の異なるバーを組み合わせることによって、バーコードの本数を少なくしたものであるが、これに本発明の情報コードの色を組み合わせれば、1本のバーで表わせる情報の種類が、幅の種類×色数となって、本発明の効果を更に大きくすることができる。

【0038】さらに本発明は二次元コードやステルスコードにも適用することができる。

【0039】二次元コードは二次元に配列した表示領域（黒又は白で塗り分けられる最少表示単位）の組み合わせにより情報を表示するもので、PDF417、カラコード等が知られている。この二次元コードにおいて、各表示領域を、反射又は放射の波長特性が異なる3種以上の表示領域によって形成し、この二次元配列における表示領域の波長特性の組み合わせを情報表示の要素とする。

【0040】この場合は、本発明の多色化による表示情報量の増大が、表示領域の配列数の多い二次元コードにおいて行われることになるので、表示情報量を、特に多

くすることができる。
【0041】ステルスコードは、蛍光体を含有する色が薄い透明なインクを用いて情報コードを印刷し、赤外線等の励起光で情報コードを照射したときに蛍光体が放射する光を検出して読み取りを行なうものである。このステルスコードは、肉眼では情報コードが見えないようにすることにより、セキュリティ性及びデザイン性に優れる特徴を持つ。

【0042】ステルスコードにおいて、本発明を実施するには、異なる波長で発光する複数種類の蛍光体を用意し、それらを含有したインクによって、表示領域を塗り分け印刷して情報コードを作る。例えば、赤色、緑色、青色を、その色で発光する蛍光体を含有したインクによって表示し、白色を上記3種の蛍光体を混合したインクによって表示し、黒色をインクを塗らないことによって表示する。

【0043】読み取りは、蛍光体を励起させる赤外光等を照射して、各色の発光を行なわせ、これを図2に示したような、フィルタと検出器を組み合わせた読み取り装置によって、各波長別の読み取りを行う。この読み取り

方式において、蛍光体は可視光でなく赤外光等の不可視光で発生するものであってもよい。

【0044】以上の実施形態では、本発明の情報コードで使用する色（反射又は放射の波長特性）として、白、黒に加えて赤、緑、青の3色を用いるものを説明したが、この3色はC（シアン）、M（マゼンダ）、Y（イエロー）であってもよく、他の色の組み合わせを用いてもよい。さらに、各色の中間色を用いる等によって使用する色数を増加すれば、表示可能な情報数を、さらに増大することができる。

【0045】反射又は放射の波長特性が異なる表示領域の種類は、3種以上用いれば、本発明の情報表示量の増大効果が得られるが、この効果は、5種以上用いることによって十分なものとなる。この色数を増加する程、その効果は飛躍的に大きくなるが、色数を余りに多くすると、読取り装置に高い精度が要求されコストがかかることになる。本発明の効果が十分に得られ、製作コストを低く抑えることができる色数として適当な色数は、現状では、例えば、白と黒に、赤、緑、青の3色、またはC（シアン）、M（マゼンダ）、Y（イエロー）の3色を加えた5色である。

【0046】

【発明の効果】本発明は、情報コードを構成する表示領域を3種以上の色（反射又は放射の波長特性）で塗り分けるようにしたから、情報コードで表示できる情報量を飛躍的に増大することができる。したがって、従来の情報コードで表示量が不足していた問題を解決するとともに、本発明による大量の情報表示機能を生かして情報コードを新たな用途に用いることができる。

【図面の簡単な説明】

【図1】 従来のモノクロのバーコードと同一の表示パターンで、本発明の情報コードを形成した例を示す図

【図2】 白色光源を用いた本発明の情報コードの読み取り装置の構成例を示す図

【図3】 R、G、Bの三色の検出信号から白と黒の信号を作り出す方法を説明するタイミング図

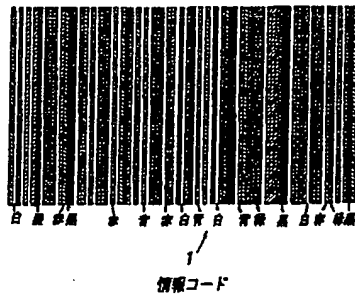
【図4】 単色光源を時分割発光させる本発明の情報コードの読み取り装置の構成例を示す図

【図5】 本発明の情報コードに、既存のモノクロのバーコードの表現方式を含ませた場合の情報コードの読取の手順を示すフローチャート

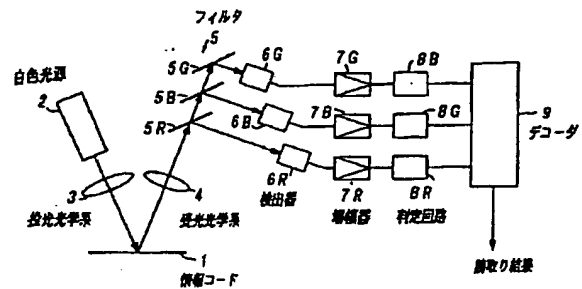
【符号の説明】

- 1 情報コード
- 2 白色光源
- 5 フィルタ
- 6, 15 検出器
- 8R, 8G, 8B, 17 判定回路
- 9, 18 デコーダ
- 11R, 11G, 11B 単色光源
- 12 単色光源の駆動回路

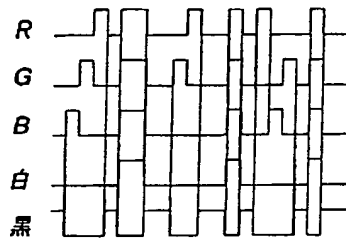
【図1】



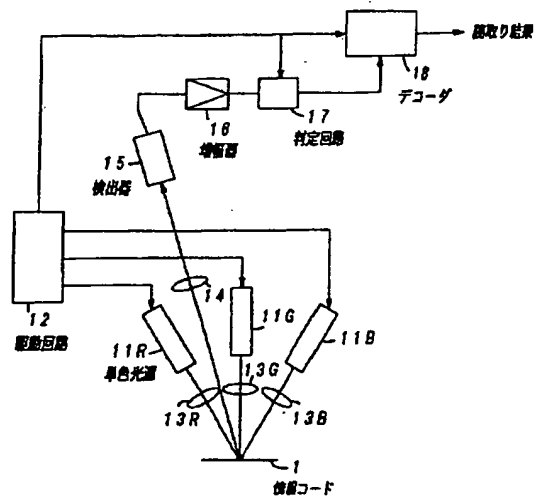
【図2】



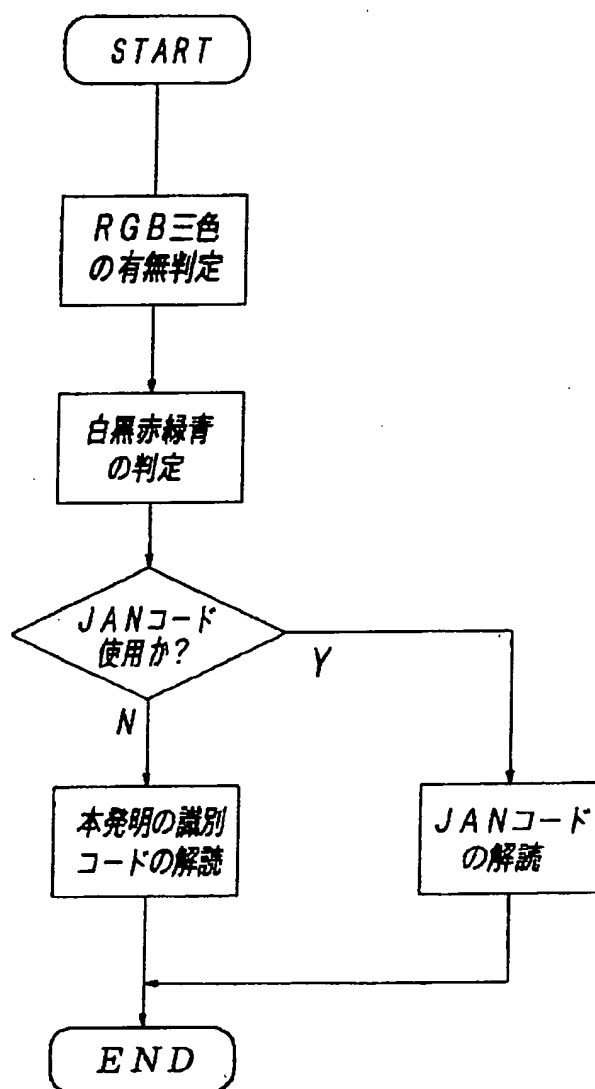
【図3】



【図4】



【図5】



) Exhibit B)

CERTIFICATION

I, Shintaro TATEYAMA, whose address is Nichimen Building 2F.,
2-2, Nakanoshima 2-chome, Kita-ku, Osaka-shi, Osaka, Japan,
hereby certify that I am the translator of the attached documents,
namely,

Japanese Unexamined Patent Publication No. 11-161757

that I am familiar with both the Japanese language and the
English language, and that the translation is a true and correct
translation from the Japanese language to the English language to
the best of my knowledge and belief.

This 25th day of August, 2005


Shintaro TATEYAMA

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Applicant : 597166914

Takahiro SAITO

Minamimotomachi 6-2-24-143

Yao-shi

Inventor : Takahiro SAITO

Minamimotomachi 6-2-24-143

Yao-shi

Patent Attorney : Shogo EHARA (and other three)

【Title of Invention】 INFORMATION CODE AND ITS READING DEVICE

【Abstract】

【Problem】

To solve without increasing identification codes, a situation that display amounts of monochrome information codes such as a bar code are limited, and the number of information codes to be displayed in each display item and the number of display items are short.

【Means by which the problem is solved】

The information code is formed by arranging three or more types of display areas in a predetermined arrangement, the display areas being different in color (reflected or radiated wavelength characteristic), and the wavelength characteristics of the display areas in the arrangement are combined to form a nit for displaying information.

【Claims for the Invention】

【Claim 1】 An information code formed by arranging three or more types of display areas in a predetermined arrangement, said display areas being different in reflected or radiated wavelength characteristic, wherein said wavelength characteristics of said display areas in said predetermined arrangement are combined to form a unit for displaying information.

【Claim 2】 An information code having a display pattern formed by arranging three or more types of display areas in the same arrangement as in one of information codes which are monochromatically displayed, said display areas being different in reflected or radiated wavelength characteristic, wherein said wavelength characteristics of said display areas in said arrangement are combined to form a unit for displaying information, and

wherein said information code has a framework defining a relationship between a combination of said wavelength characteristics of said display areas in said arrangement and information items represented thereby, said framework being designed to include a framework for monochromatically displaying information, defined by said one of said information codes.

【Claim 3】 A reader for an information code comprising:

a filter for separating reflected light or radiated light from said information code according to a difference in wavelength, said information code being formed by arranging three or more types of display areas in a predetermined arrangement, said display areas being different in reflected or radiated wavelength characteristic;

a plurality of detectors for photo-electrically converting light in every wavelength band separated by said filter;

a plurality of determination circuits for determining whether an output from each of said detectors exceeds a predetermined determination level; and

a decoder for decoding information displayed by said information code, based on a combination of said outputs from said determination circuits, and outputting said information decoded.

【Claim 4】 A reader for an information code comprising:

a plurality of monochromatic light sources provided so as to correspond to said information code being formed by arranging three or more types of display areas in a predetermined arrangement, said display areas being different in reflected or radiated wavelength characteristic, and so as to correspond to said different wavelength characteristics of said display areas;

a driving circuit for light-emitting each said monochromatic light source by timesharing;

a detector for photo-electrically converting said reflected light or said radiated light from said information code;

a determination circuit for fetching an output from said detector at every wavelength component in synchronization with a driving signal from said driving circuit, determining whether said output at said every wavelength component exceeds a predetermined determination level, and further determining which wavelength component is included in said output, based on said determination; and

a decoder for decoding information displayed by said information code, based on a combination of outputs from said determination circuit, indicative of respective colors, to thereby output a decoding result.

【Detailed Description of the Invention】

【0001】

【Technical Field of the Invention】

The present invention relates to an information code which displays information by combining a plurality of wavelength characteristics such as colors, and a reader for reading the same.

【0002】

【Prior Arts】

Information codes such as barcodes which is simple in printing and easy in reading are in widespread use as an information display means for commodities and the like.

【0003】

The barcodes are classified into various types, such as the JAN code, the standard ITF, the CODE=138, the CODE=39, and the NW-7 code, which are displayed in respective specific forms. According to the display form of the JAN code which is in wide use, seven black and white bars are combined to form one module representative of one numeral, and the 13 modules thus formed are arranged to represent 13-digit numerals. In the 13-digit numerals, the first two-digit numerals represent a national number, the next five-digit numerals a manufacturer number, and the following five-digit numerals a commodity number, respectively, and the final-digit numeral is for use in checking.

【0004】

【Problems which the Invention Solves】

In the JAN code, only the 13-digit numerals can be represented, and hence only

the five-digit numerals are allotted to display commodities. Therefore, in recent dayswhere, commodities have been classified into more various types and packaged in smaller quantities, registering new commodities requires deletion of old commodity registrations which are unnecessary any more because 5-digit number which is registered for commodities causes lack of registerable number. .

[0005]

Such lack of displayable information quantity becomes significant as the field in which the barcode is employed spreads. For instance, in a phone call statement of a telephone company, the lack of the displayable information quantity is tried to be augmented by printing both a long barcode which is increased in number of bars and a standard type barcode arranged in parallel. However, in this method of arranging a plurality of barcodes, the following problems can arise. That is, the barcodes can strongly oppress a display surface in which letters are printed, to thereby mar the appearance; a prolonged barcode is prone to be omitted when read by a hand scanner; and this method is available only if a large display space is secured. As a result, this method cannot be a radical solution to the problem.

[0006]

Further, a new usage of the barcode, such as in sales management and commodity management, has been considered by displaying, in one lump, a date of manufacture, a name of a manufacturer, a date of packing, and a shelf life. In this usage, when a purchaser of the commodity makes payment, these information items are read and recorded. However, insofar as a monochromatic barcode (which means a single color is used over a ground color, such as black and white, or red and white) is employed to display such a large quantity of information items, the display pattern can be unfavorably complicated and a barcode label can be upsized, whereby the resulting barcode is rendered impractical.

[0007]

Still further, another usage of the barcode, such as in manufacturing management site of industrial products, has been considered by not only applying simple information tags on component parts or products to be managed but also applying an information code which displays detailed information items, such as a production history and an inspection result, by means of information codes. This is for acquiring detailed information of the component parts or the products, on the manufacturing site or on the shipping site without inquiring to a control system using a host computer, etc.

[0008]

However, in this usage as well, it has been difficult to create a practical system because of limit of the displayable information quantity assigned to the monochromatic information code.

[0009]

It is therefore an object of the present invention to provide an information code with which a quantity of information is increased without changing conventional display patterns so that the problems mentioned above can be solved.

[0010]

[Means by which the Problem is Solved]

(1) The information code according to the present invention is formed by arranging three or more types of display areas in a predetermined arrangement, the display areas being different in reflected or radiated wavelength characteristic, wherein the wavelength characteristics of the display areas in the predetermined arrangement are combined to form a unit for displaying information.

[0011]

Herein, the terms "being different in reflected or radiated wavelength characteristic" means that the display areas in the predetermined arrangement to form the information code are different in color, and that when the information code is formed into a stealth code using fluorescent materials, the fluorescent materials printed in the display areas are different in emitted wavelength. Further, the terms "three or more types of display areas (are) different in reflected or emitted wavelength characteristic" means that three or more types of display areas with respectively different wavelength characteristics are provided. If the display areas which are different in size and shape are used, the number of types of the display areas is equal to the number of combination between the sizes and the shapes.

[0012]

A quantity of information which can be displayed by this information code is equal to the value which is calculated by powering a number of kind of display area with a number of lined display area. Therefore, huge amount of information can be displayed compared to the monochromatic information code.

[0013]

(2) When the information code according to the present invention is intended to be used by replacing an existing monochromatic information code, it is difficult to smoothly switch to the information code of the present invention if the number of companies adopting the existing information code is extremely large.

[0014]

To deal with this smooth switching, the present invention provides the following information code which can coexist with the other monochromatic information code.

[0015]

That is, the present invention provides the information code having a display pattern formed by arranging three or more types of display areas in the same arrangement as in one of existing information codes which are monochromatically displayed, the display areas being different in reflected or radiated wavelength characteristics, wherein the wavelength characteristics of the display areas in the arrangement are combined to form a unit for displaying information, characterized in that the information code has a framework defining a relation.

[0016]

In this information code, since an amount of information which is designated to a framework of a monochromatic information display is small compared to the overall displayable amount, the existing information code can be smoothly switched to the information code of the present invention without losing characteristic of the present invention that amount of displayed information can be increased.

[0017]

(3) Unlike the monochromatic information code, the above described information code of the present invention is formed by the three or more types of display areas which are respectively different in reflected or radiated wavelength characteristic, and therefore it is necessary to discriminate the difference when reading.

[0018]

A reader for the information code includes two types thereof, i.e. (a) a reader using white light as a light source, and (b) a reader using monochromatic light such as a laser source.

[0019]

(a) The reader using the white light as the light source, for reading the information code is comprised of a filter for separating reflected light or radiated light from the information code according to a difference in wavelength band which is in use, the information code being formed by arranging three or more types of display areas in a predetermined arrangement, the display areas being different in reflected or emitted wavelength characteristic, a plurality of detectors for photo-electrically converting light in every wavelength band separated by the filter, a plurality of determination circuits for determining whether an output from each of the detectors exceeds a

predetermined determination level, and a decoder for decoding information displayed by the information code, based on a combination of the outputs from the determination circuits, and outputting the information decoded.

[0020]

(b) The reader using the monochromatic light sources such as the laser light, for reading the information code is comprised of a plurality of monochromatic light sources provided so as to correspond to the information code being formed by arranging three or more types of display areas in a predetermined arrangement, the display areas being different in reflected or radiated wavelength characteristic, and so as to correspond to the different wavelength characteristics of the display areas, a driving circuit for light-emitting the monochromatic light source by timesharing, a detector for photo-electrically converting the reflected light or the radiated light from the information code,

a determination circuit for fetching an output from the detector at every wavelength component in synchronization with a driving signal from the driving circuit, determining whether the output at the every wavelength component exceeds a predetermined determination level, and further determining which wavelength component is included in the output, based on the determination, and a decoder for decoding information displayed by the information code, based on a combination of outputs from the determination circuit, indicative of respective colors of emitted light, to thereby output a decoding result.

[0021]

[Mode for Carrying Out the Invention]

Referring first to Fig. 1, there is illustrated an information code 1 according to an embodiment of the invention, which is displayed in the same pattern as in the JAN code. In this information code, colors used for coating each bar are red, green, and blue which are the three primary colors of light in addition to black and white. Therefore, a single bar can represent five types of information items. (In regard of this point, a bar with wider width as viewed in the figure is formed by a plurality of consecutive bars with the same color.) The information code represents information by combining these colors, and therefore it can propose $5^{(7 \times 13)} = 4.03897 \times 10^{63}$ items of information, and therefore the information quantity proposed by the information code of the invention is 1.63133×10^{36} times the information quantity of the conventional monochromatic JAN code which proposes $2^{(7 \times 13)} = 2.47588 \times 10^{27}$ items of information.

[0022]

Accordingly, the displayable information quantity extremely increases in

comparison with the conventional barcode, leading to an increased number of displayable items by the information code, whereby more display digits can be allotted to each item.

[0023]

This advantage will be described by taking for example an information code attached to commodities in a supermarket, in a more specific manner. By employing the information code of the invention, items such as a manufacture date, a packing date, a name of a manufacturer can be newly added to the information, to thereby improve control efficiency. In addition, the number of registered commodities can be increased, whereby chores of deleting registration of commodities which the supermarket has not dealt in can be dispensed with even when new commodities are registered.

[0024]

Next, the arrangement of a reader for the information code according to the invention will be described hereinbelow. Fig. 2 shows an example of the reader using a white light source, in which reference numerals 2, 3, and 4 designate a white light source, a projecting optical system for gathering light emitted from the white light source on the information code 1, and a receiving optical system for forming image of light radiated or reflected from the information code 1. Further, reference numeral 5 designates a set of filters for separating light radiated or reflected from the information code 1 at every wavelength component, which consist, in the illustrated example, for instance, of a dichroic mirror 5R for reflecting red light and allowing light other than the red light to pass through, a dichroic mirror 5 G for reflecting green light and allowing light other than the green light to pass through, and an ordinary reflector 5B for reflecting remaining blue light. Reference numerals 6R, 6G, and 6B designate detectors for red, green, and blue colors, respectively, each formed, e.g. by a photo diode or the like when reading is carried out by scanning the barcode or alternatively formed by a CCD sensor or the like when the reading is carried out by touching the barcode. Reference numerals 7R, 7G, 7B designate amplifiers provided so as to correspond to the detectors for the respective colors, and reference numerals 8R, 8G, 8B designate determination circuits for the respective colors which each compares an output from each amplifier 7R, 7G, 7B with a predetermined reference level, to thereby determine which of the color detection signals (red, green, and blue) is included in the output. Reference numeral 9 designates a decoder for determining the color of each bar by using a predetermined timing signal, and for decoding the displayed information according to the predetermined relationship between the arrangement of the bar colors and the information items, followed by outputting the thus decoded information.

[0025]

In regard of this point, the timing signal is generated based on a time period required for measuring the width of the bar as a reference value, which is measured, e.g. by a clock signal.

[0026]

In addition, although the outputs from the determination circuits 8R, 8G, 8B include only three types of signals, i.e. R, G, and B detection signals, the bar colors include black and white in addition to these colors. Therefore, as shown in Fig. 3, the decoder 9 determines that the output signal represents white when all the three detection signals are present, whereas it determines that the output signal represents black when all the three types of signals are absent. When the red, green, or blue color is determined, the R, G, or B detection signal is used on condition that white color is not determined.

[0027]

Then, a predetermined operating process is executed based on the information displayed by the information code decoded and output by the decoder 9, and the decoded information is output onto a display or paper, followed by recording, etc. of the information into an administrative computer.

[0028]

Fig.4 shows a reader according to another embodiment of the invention, in which the information code is read by using a plurality of monochromatic light sources, such as laser sources including laser scanners and hologram scanners. In this embodiment, the laser sources are used corresponding to colors used in the information code, such that the laser sources emit light by timesharing.

[0029]

In Fig. 4 reference, reference numerals 11R, 11G, 11B designate monochromatic light sources, such as laser sources emitting light with red, green, and blue colors, respectively, and reference numeral 12 a driving circuit for light-emitting each laser source by timesharing. Reference numerals 13R, 13G, 13B designate projecting optical systems for introducing light emitted from the laser sources to the information code 1, reference numeral 14 a receiving optical system for receiving light reflected by the information code 1, reference numeral 15 a detector formed by a photo diode or the like, for photo-electrically converting the light transmitted through the receiving optical system 14, and reference numeral 16 an amplifier for amplifying a photo-electrically converted output, respectively. Reference numeral 17 designates a determination circuit for fetching an output from the amplifier 16 at every wavelength

component in synchronization with a driving signal from the driving circuit 12, determining whether or not the output at every wavelength component exceeds a predetermined determination level, and further determining which wavelength band component is included in the output. Reference numeral 18 designates a decoder which outputs a digital signal by decoding information displayed by the information code, based on a combination of results of the determination by the determination circuit. The recognition of each bar by using the decoder with reference to the timing signal, determination of white and black, and outputting process of the decoder is carried out in the same matter as in the embodiment shown in Fig. 2.

[0030]

The monochromatic light source for use in the above described timesharing method is not limited to the laser source. For example, it is possible to use light-emitting diodes of three colors (R, G, and B) in place of the laser sources. The timesharing method is advantageous in that a light receiver, such as a photo diode or a CCD sensor, and a processing circuit for processing an output therefrom can be shared, and accordingly the plurality of filters and light receivers are not required unlike a case where white light source is used, which leads to simplified construction of the light receiving side of the reader.

[0031]

Next, description will be made of a case where the information code according to the invention is employed in the sales site where the monochromatic information code is actually used.

[0032]

When the information code of the invention is employed in order to cope with the lack of information quantity displayed by the conventional information code, it is impossible to cope with the information code displayed by the plurality of colors of the invention in a display manner. For example, the number of bars for use in representing a single-digit numeral is different. Therefore, it is necessary to discriminate the difference when reading.

[0033]

In this case, to read both the conventionally used monochromatic information code and a newly employed information code applied on the commodities, etc., reading means can be doubly provided. In this case, however, the reader becomes complicated, resulting in hiked costs.

[0034]

To eliminate the inconvenience, the information code according to the invention

is designed to be the same in display pattern as the other monochromatic barcode, and at the same time a framework defining the relationships between the combination of the display areas of the information code of the information and the represented information items is designed to include a framework for monochromatically displaying information, according to the other information code. By this designing, switching from the monochromatic barcode to the color barcode can be facilitated without hiked costs of the reader.

[0035]

More specifically, as shown in Fig. 1, for instance, the information code of the invention is formed by bars of five colors, i.e. white, black, red, green, and blue in the same pattern as in the JAN code, and out of the information code in the display pattern formed by the combination of the colored bars, black and white bars alone are used as the barcode of the JAN code as they are. The conventional monochromatic JAN code is different from the information code displayed by the plurality of colors of the invention in a display manner. For example, the number of bars for use in representing a single-digit numeral is different. Therefore, it is necessary to discriminate the difference when reading.

[0036]

A process for reading either the conventional monochromatic barcode or the color barcode of the invention is described in Fig. 5 for instance. This process will be described as part of the process executed by the determination circuit 17 and the decoder 18 of the reader shown in Fig. 4. First, a light receiving signal output from the amplifier 16 is processed based on a timesharing signal from the driving circuit 12 and the predetermined timing signal, to thereby determine whether or not each bar includes any of the three colors of R, G, and B. Next, it is determined whether the color of each bar is white, black, red, green, or blue, based on the principle described hereinbefore with reference to Fig. 3. Then, it is determined whether or not all the bars or the bars in a specific range assume white or black, and based on a result of the determination, it is further determined whether or not the conventional JAN code is used. If the bars are displayed by the conventional JAN code, a JAN code interpretation table is referred to, whereas if they are displayed by the information code of the invention, an information code interpretation table of the invention is referred to. Then, data represented by the bar code are decoded, followed by outputting digital data. In regard of this point, the determination as to whether the conventional JAN code is employed may be carried out to the entire information code or alternatively to each information unit, such as a commodity code out of the entire information code.

[0037]

The above description has been made of the information code having the same display pattern as in the JAN code, but this is not limitative. Alternatively, the information code of the present invention can be applicable to barcodes having the other display forms, such as the standard ITF, the CODE=138, the CODE=39, and the NW-7 code, as well. For example, the standard ITF and the CODE=138 are the forms in which the number of the barcodes are reduced by combining bars with different widths. Therefore, when colors of the information code of the invention are combined with these bars, the number of information items represented by a single bar is as many as (the number of width types) \times (the number of colors), and therefore the effect of the present invention can be further enhanced.

[0038]

Further, the present invention is also applicable to a two-dimensional code and a stealth code.

[0039]

The two-dimensional code is for displaying information by combining two-dimensionally arranged display areas (minimum display units coated with black or white), which includes the well-known PDF417, Carra code, etc. According to the invention, this two-dimensional code is formed by the three or more display areas which are different in reflected or radiated wavelength characteristic, and the wavelength characteristics of the respective display areas in the two-dimensional arrangement are combined to represent a unit for displaying information.

[0040]

In this case, the increased quantity of the displayable information brought about by multi-coloring according to the invention is displayed in the two dimensional code having a large number of arrangements of the display areas. As a result, the quantity of displayable information can be especially increased.

[0041]

In the stealth code, the information code is printed by using pale transparent ink containing a fluorescent material, and when the information code is irradiated by excitation beams such as infrared rays, light radiated from the fluorescent material is detected, to thereby carry out reading. The stealth code is rendered invisible with naked eyes, and therefore it is excellent in security and designing.

[0042]

In implementation of the information code of the invention in the stealth code, a plurality of types of fluorescent materials which radiates light with different

wavelengths are provided, and the display areas are coated with inks containing the fluorescent materials, followed by printing the information code. For example, red, green, and blue are displayed by coating the areas with the inks containing the fluorescent materials radiating light of the respective colors, white is displayed by an ink containing a mixture of the above three fluorescent materials, and black is displayed by not coating the area.

[0043]

Reading is carried out in the following manner: That is, infrared rays or the like for exciting the fluorescent materials are applied to the fluorescent materials, to radiate beams of the respective colors, and the thus radiated beams with different wavelengths are read by the reader formed by combining the filter and the detector, as shown in Fig. 2, at every wavelength. In this reading system, the fluorescent material may be one which radiates not visible rays but invisible rays such as infrared rays.

[0044]

In the above embodiments, colors (reflected or radiated wavelength characteristics) employed in the information code of the invention are red, green, and blue, in addition to black and white, but this is not limitative. Alternatively, the colors may be cyan (C), magenta (M), and yellow (Y), or the other combination of colors. Further, the number of the colors can be increased by employing neutral colors between these employed colors, which further increases the number of displayable information items.

[0045]

If more than three kinds of display area which have different reflected or radiated wavelength characteristics are used, increasing effect of the number of displayable information of the present invention can be obtained. If more than three kinds are used, it becomes sufficient. As the number of colors is increased, the effect extremely increases. However, a too large number of the colors requires a reader with higher accuracy, which imposes high costs. The suitable number of colors with which satisfactory effect of the invention is achieved and at the same time manufacturing costs can be suppressed low is five, under current circumstances, i.e. three colors of red, green, and blue or cyan, magenta, and yellow, in addition to black and white.

[0046]

[Effect of the invention]

By applying this invention, a quantity of information which can be displayed by the information code is increased exponentially because a displaying area constituting

an information code is separated into more than three colors. (reflected or radiated wavelength characteristics) Therefore, it solves the problem of lack a quantity of display of conventional information codes, and an information code can be utilized in new ways by ability of the present invention to display huge amount of information.

[Brief Description of the Drawings]

[Fig.1] A view showing an example of an information code formed in the same display pattern as in a conventional monochromatic barcode.

[Fig.2] A block diagram showing the arrangement of an information code reader using a white light source, according to the present invention.

[Fig.3] A timing chart which explains a manner of black and white indication signals based on three (R, G, and B) detection signals.

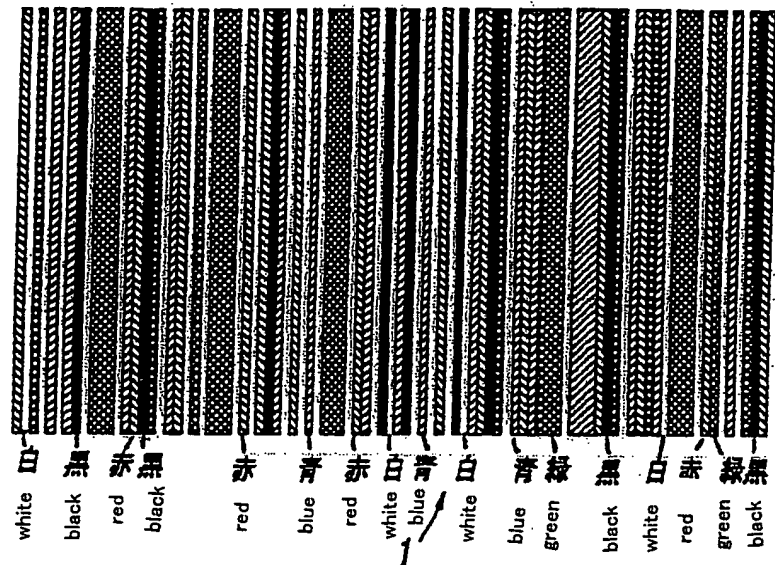
[Fig.4] A block diagram showing information code reader using a monochromatic light source in a manner of emitting the light by timesharing, according to the present invention.

[Fig.5] A flowchart showing a process for determining a color, which is executed by a decoder of the reader, based on a result of determination by a determination circuit.

[Description of Signs]

- | | |
|----------------|---|
| 1. | information code |
| 2. | white light source |
| 5. | filter |
| 6, 15 | detector |
| 8R, 8G, 8B, 17 | determination circuit |
| 9, 18 | decoder |
| 11R, 11G, 11B | monochromatic light source |
| 12 | driving circuit of monochromatic light source |

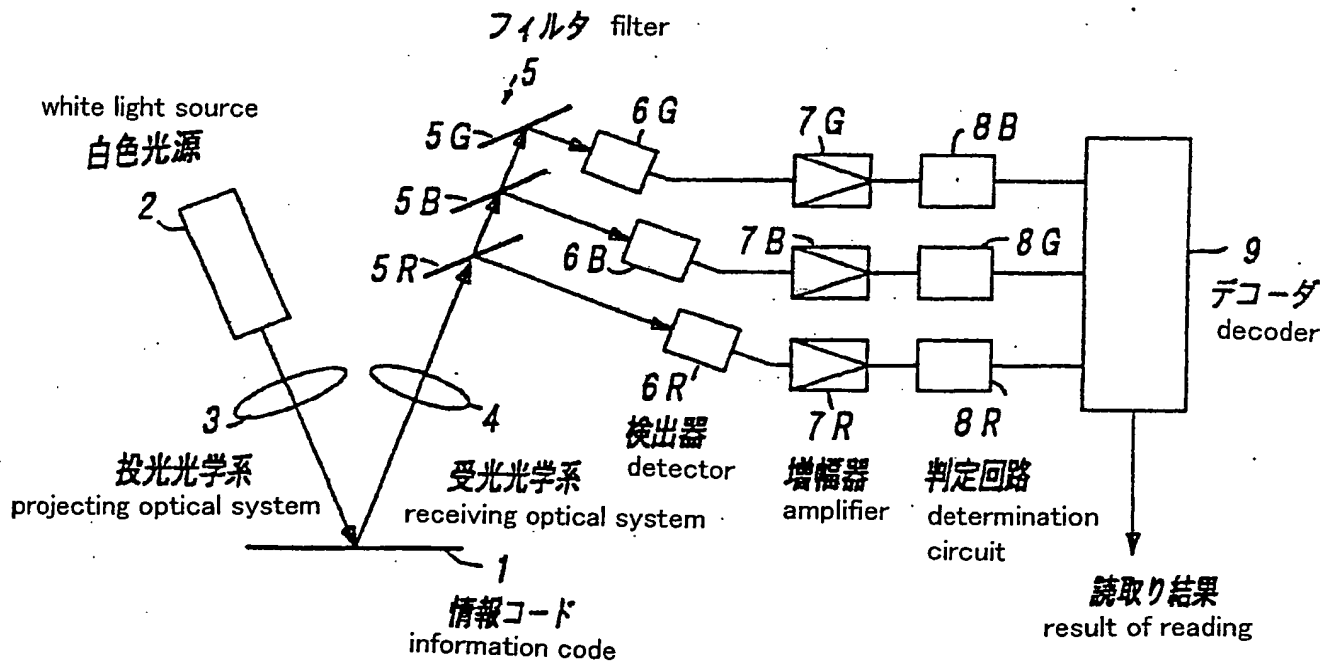
[FIG. 1]



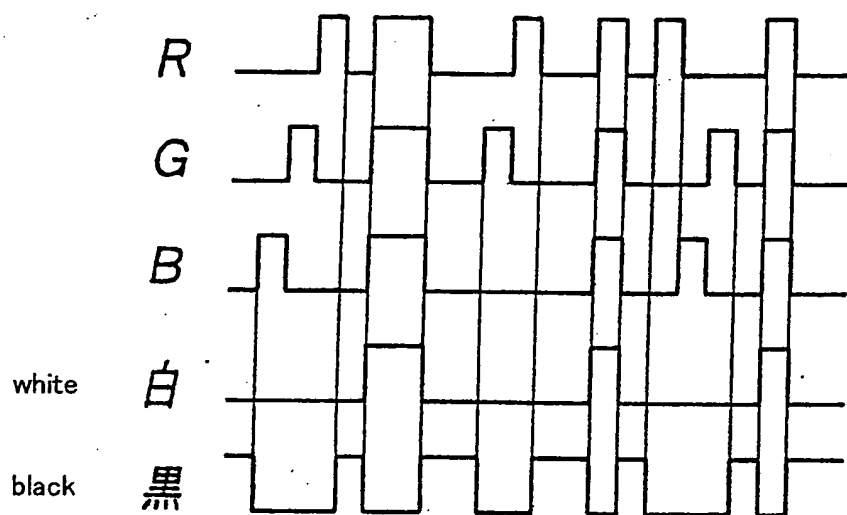
情報コード

information code

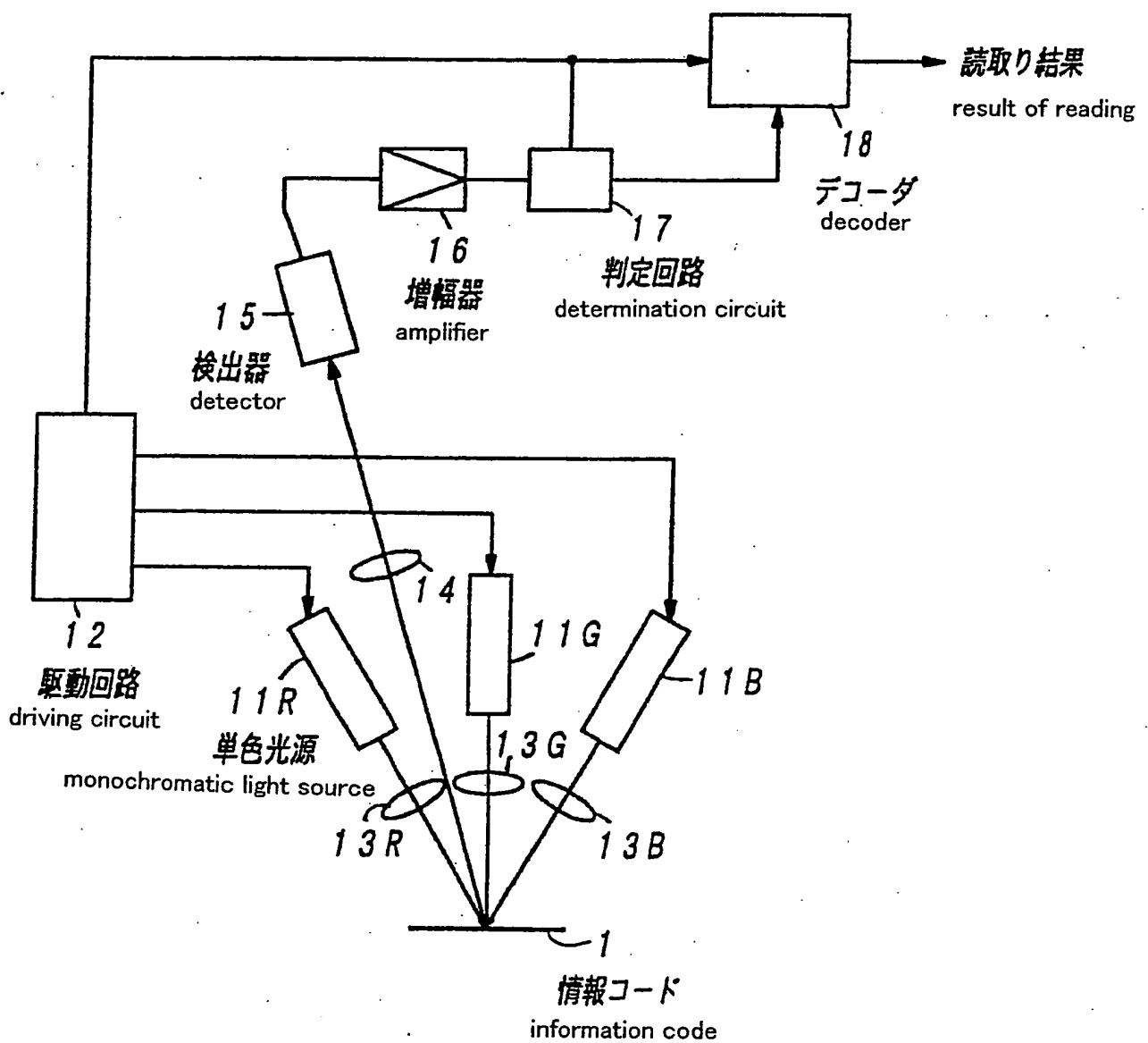
[FIG. 2]



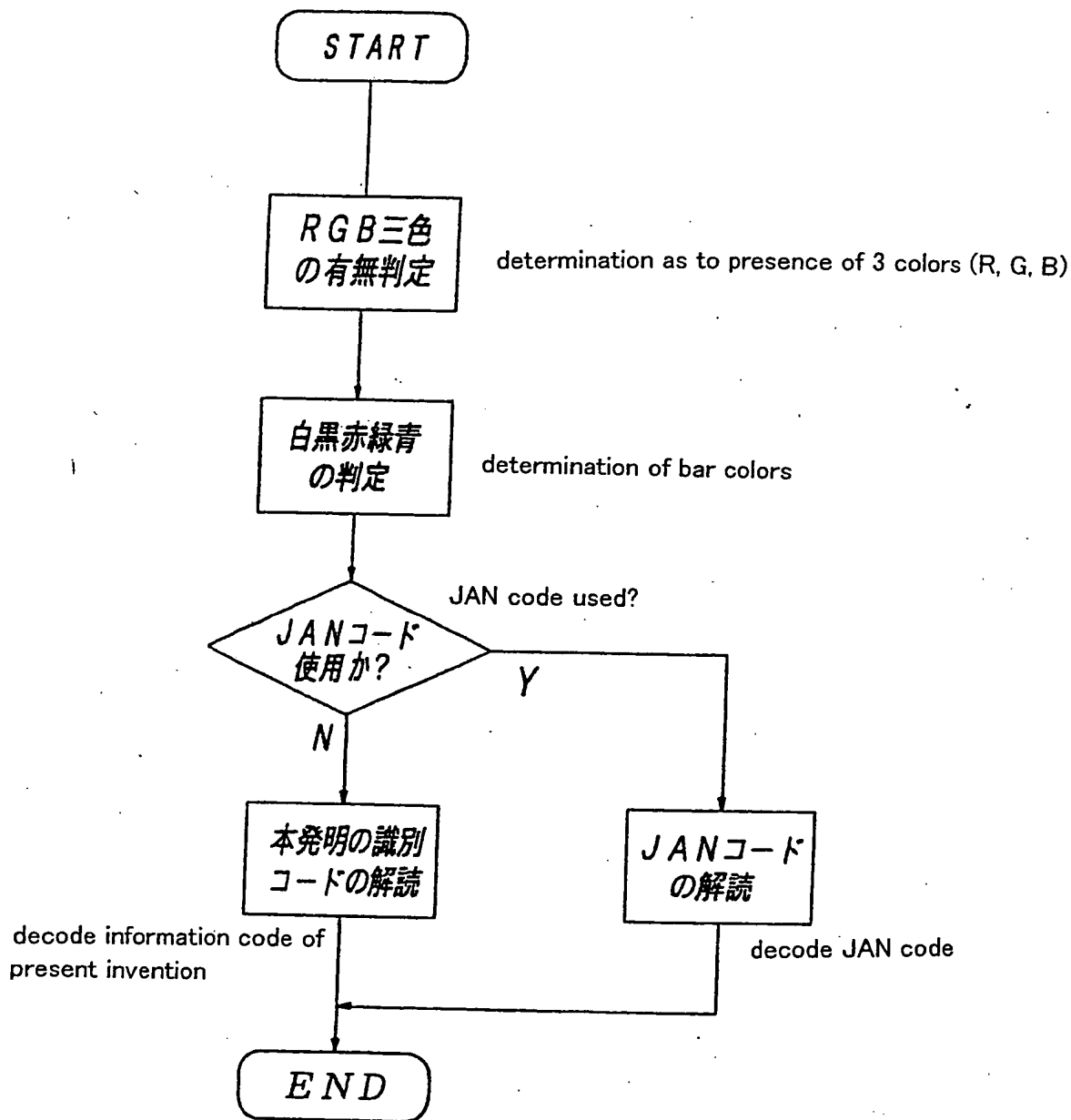
[FIG. 3]



[FIG. 4]



[FIG. 5]



In re application of: TAKAHIRO SAITO et al.)
Application No.: 10/800,386)
Filed: March 12, 2004)
For: INFORMATION CODE AND ITS)
READING DEVICE)

DECLARATION UNDER 37 CFR 1.131

I, Takahiro, Saito, hereby declare that:

1. I am the sole inventor of the above-identified U.S. patent application.
2. The claimed invention of the above-identified U.S. patent application was fully described and supported in a Japanese patent application No. 9-328040 filed on November 28, 1997, which was published on June 18, 1999 as Japanese Unexamined Patent Publication No. 11-161757. Exhibit A is a copy of the Japanese Unexamined Patent Publication No. 11-161757.
3. I am the sole inventor of the Japanese patent application No. 9-328040. Therefore, as evidenced by Exhibit A, the claimed invention of the above-identified U.S. patent application was constructively reduced to practice on November 28, 1997, which antedates the 35 U.S.C. 102(e) date of U.S. Patent No. 6,375,075 to Ackley et al. The 35 U.S.C. 102(e) date of U.S. Patent No. 6,375,075 is October 18, 1999.
4. Exhibit B is a true English translation of Exhibit A with a Verified Statement of the translator.
5. I declare that all the statements made herein of own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application and any patent issued thereon.

Date:

August 30, 2005

Name: Takahiro Saito

Takahiro Saito